

Y02A001

Title: High Resolution and Rapid Three Dimensional Object Generator

Field of Invention:

The field is to make rapid prototypes of 3 dimensional structures using various materials.

Prior Art:

USPTO 6,504,127 "Laser consolidation methodology and apparatus for manufacturing precise structures" by MaGregor, et al. at January 7, 2003 for cutting material to make 3 D structure using laser scanner. But this method is not fast enough for recent applications.

Back ground of invention:

It is important to make 3 dimensional model & object quickly. One of the reasons is that people like engineers can examine what they are designing. Also, one can input 3 dimensional object and duplicate with the same or various sizes, materials, colors. There are some 3 dimensional object making machines but they are still not fast enough and not high resolution enough for certain applications such as instant prototyping.

Summary:

In order to overcome the speed and resolution of conventional 3 dimensional prototyping, we uses the fast image projecting system with fast reactant for the beam projection. First, recent development of the micro-displays is one of factors for us to create 3 dimensional object generator with the fast resolution and high resolution. Second, recent development of materials quick reactant to beams such as photons (microwave range, ultraviolet, visual range, infrared, etc.), electron beam, ultrasound beam, etc. are another factor to let us to produce 3 dimensional object generator. The materials can be reacted chemically, hardened, softened or cut by the energy of the beam (like laser beam). Third, the development of the 3 dimensional image/object input device are incredible, like scanning system SONY entertainment vision, Minolta vivid 300, LDI, CGI have quick and high resolution 3 dimensional input devices. Fourth, of course, the computer speed of recent year has been increasing a lot which enable us to make the system much faster as well. The way how this system works is to project beams with images to material means that react with those beam. By controlling the image and material with fast computers, one can make 3 dimensional object quickly. Optionally, the 3 dimensional input device to get the 3 dimensional image/object data can be added. Optionally, the relative distance between object and projector can be controlled by base height/position controller or by projector height/position controller. For example, add a layer of liquid chemical source and use blue light to harden the chemical, adjust height of surface to proper position, and add a layer to repeat to create 3D object by adding sliced figures of object.

Figures:

Figure1 shows the example diagram of the concept of 3 dimensional object generator

Figure2 shows the alternative example diagram of the 3 dimensional object generator

Figure3 shows the example method how to develop the layers of 3 dimensional object

Figure4 shows the example connection to the 3 dimensional image/object input device

Figure5 shows the example diagram of matrix light unit that can be used as the micro-display

Detailed Explanation of figures:

Figure1 shows the example diagram of the concept of 3 dimensional object generator. This one shows the beam sources such as arc lamp, laser, electron beam source, microwave, etc. are projected to micro-display system and projected to material that react to such beams. The material can be hardened or softened depending on the application. Optionally, the height of the material can be controlled. Also, optionally, the vari-focal/tele-centric method can be used to create the sharp images on the surface or inside of the material to create 3 dimensional object.

Figure2 shows the alternative example diagram of the 3 dimensional object generator. Laser beam is used and tele-centric method (parallel beam) is chosen here. Also this shows the alternative method of material supply if the supply material is soft (liquid).

Figure3 shows the example method how to develop the layers of 3 dimensional object. The image can be projected to each surface of material from bottom. (The base can be placed at first.) After the material is harden or soften, the system raises the level to go to next layer. By repeating this, one can achieve to make 3 dimensional object. It can be done directly inside of material by having focus to right layers as well.

Figure4 shows the example connection to the 3 dimensional image/object input device. The implantation of 3 dimensional image/object input device enable to input the 3 dimensional image/object and output (duplicate) the 3 dimensional object in such a short time.

Figure5 shows the example diagram of matrix light unit that can be used as the micro-display. Each small unit changes the location (height and/or angle) to create the deflect light in multiple dimension. It can be made in silicon, but can be other material as well. The response time is so short that images can be generated very quickly. This can be used for various applications such as 3 dimensional display (projector), 3 dimensional object generator.